What is claimed is:

1. An awakening level estimation apparatus for vehicle comprising:

a signal processing part for calculating each frequency component power by making frequency conversion of a displacement amount of a vehicle in a direction of vehicle width detected in a time series manner;

a frequency component amount calculation part for calculating an average value of the frequency component powers calculated by the signal processing part as a high frequency component amount and also calculating a maximum value of the frequency component powers within a predetermined frequency domain including a stagger frequency to become apparent in a state in which an awakening level of a driver decreases as a low frequency component amount;

a correction factor calculation part for calculating a high frequency percentile value in which the proportion of the total sum to the sum of incidences counted from the lower frequency component powers results in a predetermined proportion in a histogram of the high frequency component amount and calculating a low frequency percentile value in which the proportion of the total sum to the sum of incidences counted from the lower frequency component powers results in a predetermined proportion in a histogram of the low frequency component amount

and calculating a correction factor based on the high frequency percentile value and the low frequency percentile value;

an evaluation value calculation part for calculating an evaluation value by correcting a ratio between the high frequency component amount and the low frequency component amount by the correction factor; and

a decision part for deciding an awakening level of a driver based on the evaluation value.

2. The awakening level estimation apparatus for vehicle as defined in claim 1, wherein the predetermined proportion is between about 70 % and about 90 %.

3. The awakening level estimation apparatus for vehicle as defined in claim 1, wherein the correction factor calculation part calculates a first ratio between a predetermined normal high frequency percentile value corresponding to a high frequency percentile value of a normal driver and the calculated high frequency component percentile value and calculates a second ratio between a predetermined normal low frequency percentile value corresponding to a low frequency percentile value of a normal driver and the calculated low frequency component percentile value and calculates the correction factor based on the first ratio and the second ratio.

4. The awakening level estimation apparatus for vehicle as defined in claim 2, wherein the correction factor calculation part calculates a first ratio between a predetermined normal high frequency percentile value corresponding to a high frequency percentile value of a normal driver and the calculated high frequency component percentile value and calculates a second ratio between a predetermined normal low frequency percentile value corresponding to a low frequency percentile value of a normal driver and the calculated low frequency component percentile value and calculates the correction factor based on the first ratio and the second ratio.

5. The awakening level estimation apparatus for vehicle as defined in claim 3, wherein the proportion of the normal low frequency percentile value to the normal high frequency percentile value is between 2 times and 2.5 times.

6. The awakening level estimation apparatus for vehicle as defined in claim 4, wherein the proportion of the normal low frequency percentile value to the normal high frequency percentile value is between 2 times and 2.5 times.

7. The awakening level estimation apparatus for vehicle as in claim 1, wherein the evaluation value calculation part calculates a ratio between the high frequency component amount

and the low frequency component amount as the evaluation value in one of the case that the high frequency percentile value is larger than a predetermined upper limit value and the case that the high frequency percentile value is smaller than a predetermined lower limit value.

8. The awakening level estimation apparatus for vehicle as in claim 6, wherein the evaluation value calculation part calculates a ratio between the high frequency component amount and the low frequency component amount as the evaluation value in one of the case that the high frequency percentile value is larger than a predetermined upper limit value and the case that the high frequency percentile value is smaller than a predetermined lower limit value.

9. The awakening level estimation apparatus for vehicle as in claim 1, wherein the correction factor calculation part calculates a correction low frequency percentile value by multiplying the low frequency percentile value by a ratio between the normal high frequency percentile value and the high frequency percentile value, and the evaluation value calculation part calculates a ratio between the high frequency component amount and the low frequency component amount as the evaluation value in one of the case that the correction low frequency percentile value is larger than a predetermined upper limit value and the

case that the correction low frequency percentile value is smaller than a predetermined lower limit value.

10. The awakening level estimation apparatus for vehicle as in claim 8, wherein the correction factor calculation part calculates a correction low frequency percentile value by multiplying the low frequency percentile value by a ratio between the normal high frequency percentile value and the high frequency percentile value, and the evaluation value calculation part calculates a ratio between the high frequency component amount and the low frequency component amount as the evaluation value in one of the case that the correction low frequency percentile value is larger than a predetermined upper limit value and the case that the correction low frequency percentile value is smaller than a predetermined lower limit value.

11. The awakening level estimation apparatus for vehicle as in claim 1, wherein the frequency component power is leveled by multiplying the frequency component power by a value multiplied by the frequency component power by a power number n of each frequency.

12. The awakening level estimation apparatus for vehicle as in claim 10, wherein the frequency component power is leveled by multiplying the frequency component power by a value

multiplied by the frequency component power by a power number n of each frequency.

13. The awakening level estimation apparatus for vehicle as in claim 1, wherein the evaluation value calculation part calculates a high frequency component amount based on frequency component powers excluding a maximum value among the respective frequency component powers calculated by the frequency component amount calculation part.

14. The awakening level estimation apparatus for vehicle as in claim 12, wherein the evaluation value calculation part calculates a high frequency component amount based on frequency component powers excluding a maximum value among the respective frequency component powers calculated by the frequency component amount calculation part.

15. The awakening level estimation apparatus for vehicle as in claim 1, wherein the evaluation value calculation part calculates the evaluation value with time, and the decision part decides that it is in a situation in which a driver is to be warned in the case that a value of a counter is increased or decreased in response to the evaluation value and also the value of the counter reaches a determination value.

16. The awakening level estimation apparatus for vehicle as in claim 14, wherein the evaluation value calculation part calculates the evaluation value with time, and the decision part decides that it is in a situation in which a driver is to be warned in the case that a value of a counter is increased or decreased in response to the evaluation value and also the value of the counter reaches a determination value.

17. An awakening level estimation method for vehicle, the method for deciding an awakening level of a driver based on an evaluation value calculated, comprising:

a first step of calculating each frequency component power by making frequency conversion of a displacement amount of a vehicle in a direction of vehicle width detected in a time series manner;

a second step of calculating an average value of the frequency component powers calculated by the signal processing part as a high frequency component amount;

a third step of calculating a maximum value of the frequency component powers within a predetermined frequency domain including a stagger frequency to become apparent in a state in which the awakening level of the driver decreases as a low frequency component amount;

a fourth step of calculating a high frequency percentile value in which the proportion of the total sum to the sum of

incidences counted from the lower frequency component powers results in a predetermined proportion in a histogram of the high frequency component amount;

a fifth step of calculating a low frequency percentile value in which the proportion of the total sum to the sum of incidences counted from the lower frequency component powers results in a predetermined proportion in a histogram of the low frequency component amount;

a sixth step of calculating a correction factor based on the high frequency percentile value and the low frequency percentile value; and

a seventh step of calculating an evaluation value by correcting a ratio between the high frequency component amount and the low frequency component amount by the correction factor.

18. The awakening level estimation method for vehicle as defined in claim 17, wherein the predetermined proportion is between about 70 % and about 90 %.

19. The awakening level estimation method for vehicle as defined in claim 17, wherein the sixth step includes a step of calculating a first ratio between a predetermined normal high frequency percentile value corresponding to a high frequency percentile value of a normal driver and the calculated high frequency component percentile value, a step of calculating

a second ratio between a predetermined normal low frequency percentile value corresponding to a low frequency percentile value of a normal driver and the calculated low frequency component percentile value, and a step of calculating the correction factor based on the first ratio and the second ratio.

20. The awakening level estimation method for vehicle as defined in claim 18, wherein the sixth step includes a step of calculating a first ratio between a predetermined normal high frequency percentile value corresponding to a high frequency percentile value of a normal driver and the calculated high frequency component percentile value, a step of calculating a second ratio between a predetermined normal low frequency percentile value corresponding to a low frequency percentile value of a normal driver and the calculated low frequency component percentile value, and a step of calculating the correction factor based on the first ratio and the second ratio.

21. The awakening level estimation method for vehicle as defined in claim 19, wherein the proportion of the normal low frequency percentile value to the normal high frequency percentile value is between 2 times and 2.5 times.

22. The awakening level estimation method for vehicle as defined in claim 20, wherein the proportion of the normal

low frequency percentile value to the normal high frequency percentile value is between 2 times and 2.5 times.

23. The awakening level estimation method for vehicle as in claim 17, wherein in the seventh step, a ratio between the high frequency component amount and the low frequency component amount is calculated as the evaluation value in one of the case that the high frequency percentile value is larger than a predetermined upper limit value and the case that the high frequency percentile value is smaller than a predetermined lower limit value.

24. The awakening level estimation method for vehicle as in claim 22, wherein in the seventh step, a ratio between the high frequency component amount and the low frequency component amount is calculated as the evaluation value in one of the case that the high frequency percentile value is larger than a predetermined upper limit value and the case that the high frequency percentile value is smaller than a predetermined lower limit value.

25. The awakening level estimation method for vehicle as in claim 17, wherein in the sixth step, a correction low frequency percentile value is calculated by multiplying the low frequency percentile value by a ratio between the normal

high frequency percentile value and the high frequency percentile value and in the seventh step, a ratio between the high frequency component amount and the low frequency component amount is calculated as the evaluation value in one of the case that the correction low frequency percentile value is larger than a predetermined upper limit value and the case that the correction low frequency percentile value is smaller than a predetermined lower limit value.

26. The awakening level estimation method for vehicle as in claim 24, wherein in the sixth step, a correction low frequency percentile value is calculated by multiplying the low frequency percentile value by a ratio between the normal high frequency percentile value and the high frequency percentile value and in the seventh step, a ratio between the high frequency component amount and the low frequency component amount is calculated as the evaluation value in one of the case that the correction low frequency percentile value is larger than a predetermined upper limit value and the case that the correction low frequency percentile value is smaller than a predetermined lower limit value.